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THE MADRAS MEDICAL JOURNAL.

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ON THE RELATIVE FREQUENCY OF SUPRACLAVICULAR AND INFRACLAVICULAR PULMONARY TUBERCULOSIS AND ITS BEARING ON THE PROGNOSIS OF THE DISEASE IN THIS COUNTRY.*

By M KESAVA PAI, M D, AND K VASUDEVA RAO, M.D

(*From the Tuberculosis Hospital, Madras*).

In the diagnosis of early pulmonary tuberculosis by physical signs, it has been taken as a clinical dogma that signs observed at the apex, *i.e*, in the first intercostal space and above should as a rule be considered to be due to tuberculous disease, whilst signs lower down with nothing abnormal above the second rib in front should be looked upon as non-tuberculous in nature

With the introduction of the Roentgen rays and their application to the diagnosis of pulmonary tuberculosis our ideas of the pathology of tuberculosis of the lungs have undergone a considerable change. The comparative freedom from opacity of the hilus of the lung in the infant, the increase in the area and depth of this opacity in the growing child and adult, the frequent presence of opaque calcareous masses in the region of the hilus and the adjoining lung substance, the postmortem findings of healing and healed lesions, especially at the root of the

* Read before the Indian Science Congress, January 1930 at Allahabad

lungs and in the mediastinal glands of clinically non-tuberculous individuals dying from other causes and the observations made in all modern countries on the incidence of allergy increasing rapidly from infancy to adult life in apparently normal individuals as indicated by the cutaneous reaction of Von Pirquet, have gradually led the pathologist to a change in his views as regards the origin and course of the disease in the lungs.

It is a common observation made by the Roentgenologist and the pathologist that there is a large number of cases where signs of tuberculous deposit are evident in the region of the hilus glands and the lung substance surrounding it, without any signs of implication of the apex and a close study of serial roentgenograms of a large number of cases of early and suspected pulmonary tuberculosis have revealed the presence of tuberculous extensions from the region of the hilum into the periphery of the lung more frequently in an upward and outward direction than towards the base, without any involvement of the actual apex. This has been explained to be due to extension of infection along the lymphatic channels connecting the central lymphatic glands in the mediastinum with the lymphoid tissue in the periphery of the lung, the anastomotic channels between the mediastinal glands and the lymphoid tissue at the apex and the supraclavicular lymphatics being considered to be the most patent and free of all, causing a predominance in the extensions towards the apex

In the pre-Roentgen days when the localization of tuberculous disease in the lungs had to be made by physical examination alone, which could not as a rule reveal disease at the hilus, the first signs were for obvious reasons noticed mostly at the apex, but with the introduction of X-ray diagnosis and the confirmation of

physical diagnosis with the skiagram, it has become increasingly evident that a large number of active cases of pulmonary tuberculosis show the initial lesion below the apex which remains free up to a comparatively late stage of the disease Thus Fishberg [1] at the last annual meeting of the British Medical Association at Manchester laid great emphasis on what he called the sub-apical or subclavicular localization of tuberculous lesions in the lungs, predominating over the true apical.

William Ewart [2] and Kingston Fowler [3] in England, Fishberg and others in America, and a number of pathological anatomists on the continent have similarly described that the early lesions as well as the cavities resulting from their breakdown are much more frequent at a distance lower down in the first and second intercostal spaces than at the apex, and Fishberg [1] by a study of the clinical history of a large number of such cases considered that the subclavicular type of cases was more acute and more virulent than the true apical cases

The diagnosis of apical tuberculosis by physical examination alone without confirmation by the X-rays is by no means free from error. A comparative study of a larger number of cases by physical signs and by Roentgenology has made it sufficiently evident that the presence of such physical signs as harsh breath sounds, broncho-vesicular breath sounds and even occasionally bronchial murmurs at the apex is not at all inconsistent with an apex free from disease, the causation of such abnormal breathsounds being apparently due to hilus disease or to density of tissue by deposit, fibrosis, etc, in the upper lobe between the root of the lung and the apex. It is thus evident that the diagnosis of the pathological condition by physical examination alone cannot be considered to be accurate or reliable.

In the investigation which forms the subject of this paper we have therefore relied more upon the X-ray appearances of the lungs than on the results of physical examination. It must however be mentioned that with the exception of a comparatively small proportion of cases the results of physical examination have closely agreed with the X-ray findings

The cases constituting our series can, for purpose of pathological classification be divided into six groups.

1. Cases of extensive implication of the lungs including the apex in which it was not possible to locate the original focus with certainty.

2. Cases where the lesion could be localized in the infraclavicular region, *i e.*, in the first or second intercostal spaces.

3. Cases in which the lesion was in the middle zone of the lung, with the rest of the lung parenchyma in a healthy condition.

Cases in which the lower zone of the lung was the seat of tuberculous disease, with no implication of the upper two thirds.

5. The true apical cases where the focus was at the actual apex alone, *i e*, in the supraclavicular region

6. Cases where there was evidence of implication of the hilus glands with little or no signs of disease in the parenchyma of the lung.

A large number of the cases, *viz*, 240 out of 1,497 belonged to class I, evidently on account of the case not coming for admission into hospital until they reached an advanced stage In a large number of cases however it

was possible by a close scrutiny of the skiagrams to arrive at a decision as to the primary seat of the disease. Thus cases showing extensive fibrosis or a fibro-caseous involvement in the infraclavicular region, with recent infiltration and soft deposit at the apex and downwards towards the mid zone and base, with justification, be classified as cases where the primary focus was subapical Many of these cases showed a cavity in the first or second intercostal space with thick fibrosed walls and situated more towards the outer aspect of the chest Some others of the group showed very extensive and dense involvement of one lung with a commencing focus in the subclavicular region of the collateral lung with the apex of the latter quite free from disease

A very common seat of deposit in the second and third groups was the axillary aspect of the second or third intercostal space with the rest of the parenchyma intact. Cases with fairly extensive involvement of the middle zone and a cavity in it outside the hilum were also common in the third group.

Twenty-two cases had involvement of the lower zone alone with cavities in 4 cases.

The true apical cases were very few there having been only 4 in the series

The most common type of the incipient cases that came under treatment were the 'Hilus' cases of which there were 457 in the series. These patients were admitted into the hospital for low and irregular pyrexia, bronchitis and general symptoms including loss of appetite and fatigue on exertion with no definite signs of pulmonary tuberculosis excepting harsh breathing at the apices or in the hilus region or broncho-vesicular breath sounds in those areas, deficient entry of air into the

apices or bases or both, and slight impairment of the percussion note over these regions. Tubercle bacilli could not as a rule be detected in the sputum of these cases Von Pirquet's reaction give a positive result. Skiagrams showed marked opacities at the hilus of lungs, often with calcified deposits in and about them, peri-bronchial thickening with heavy bronchial shadows especially towards the bases and what looked like calcified spots in the course of the linear bronchial shadows giving them an irregular beaded appearance. A certain amount of general fibrosis, marked in a few cases, was as a rule present No signs of soft deposit in the pulmonary paranchyma were evident

Judging from the above figures there seems to be a marked difference in the ratio of supraclavicular to infraclavicular lesions found in Southern India, *viz.*, about 1 per cent. compared with those found in western countries where they seem to constitute about 15 to 20 per cent. of all early cases.

The difficulty of locating early infraclavicular lesions by physical examination even when the general condition indicates marked toxæmia, the consequent delay in the diagnosis by the majority of medical men who have no X-ray facilities at hand and the neglect of early treatment account in part for the worse prognosis of pulmonary tuberculosis in this country *The duration of the disease*, as judged by the history of the cases seems to indicate the more frequent occurrences of the acuter cases here than in Europe Cavities have been seen in many cases that have given a history of four weeks or less since the onset of the first symptoms, and an occasional case has come into the hospital for hæmoptysis with practically no history of previous cough,

in which a skiagram has shown definite signs of a small cavity at or near the hilus or in the upper lobe

Table I gives an idea of the incidence and the prognosis in the 3 stages of pulmonary tuberculosis in the Madras Tuberculosis Hospital, compared with the corresponding figures for England as given by Kingston Fowler.[4] The difference between the Indian and English figures is very striking.

TABLE I.

Comparative results of treatment in different stages in England and in Southern India.

—	Results in England.			Results in Madras			Remarks.
	Arrested and much improved	Relieved	No benefit.	Arrested and much improved	Relieved.	No benefit	
I Stage ...	90%	9%	1%	60%	34%	6%	
II Stage ...	81%	17%	2%	69%	18%	13%	
III Stage ...	45%	37%	18%	32%	34%	34%	

1. Whilst there are 15 to 20% of supraclavicular amongst early cases in western countries there are much fewer of such cases in Southern India (about 1% in our series).

2 The acuteness of type and the prognosis of pulmonary tuberculosis for all ages are more unfavourable in this country than in Europe This is indicated in Table I where it is seen that whilst 99%, 98% and 82% of the cases benefit in the I, II and III stages respectively

in England, the figures of the Madras Tuberculosis Hospital show a similar improvement in 93%, 87% and 66% respectively In the same table it is also seen that the figures for cases arrested and much improved are 90%, 81% and 45% in England, but only 60%, 69% and 32% in Madras. The fact that the Madras figure for improvement in stage II is better than that in stage I is apparently due to most of the stage II cases having been placed under artificial pneumothorax treatment.

Table II which gives the relative incidence of primary localization is very interesting The hilus cases where on account of the innate or acquired resistance of the individual the infection has not proceeded beyond the hilus glands naturally constitute the vast majority of the cases This agrees with pathological findings which have revealed latent tuberculous lesions in lungs in 50 to 90 % of persons dying from other diseases The sub-apical cases stand next in frequency and then come the advanced and the middle zone and basal affection cases. The true apical involvement is very rare there having been only 4 cases in the series of 1,497

TABLE II.

Analysis of 1,497 cases treated in the Madras Tuberculosis Hospital 1926—1929.

Advanced cases	. 240
Sub-apical cases	. 389
Middle zone affections	.. 145
Apical cases	... 4
Hilus cases	... 457
Basel affections	... 22
Total	... 1,497

Table III gives the prognosis of these different types. It is interesting to note that the advanced and basal affections give the worst results, the middle zone and sub-apical affections stand next and the hilus involvement are the most favourable.

TABLE III.

Results of treatment in the various types of pulmonary Tuberculosis classified according to localization.

MADRAS TUBERCULOSIS HOSPITAL.

—	Arrested	Relieved	No result	Total No
Sub Apical	64 40·4%	54 34 1%	40 25·4%	158
Hilus	103 60 9%	54 31 9%	12 7·2%	169
Middle zone	36 45 5%	24 30 3%	19 24 2%	79
Advanced	15 25%	21 35%	24 40%	60
Basal	4 18 2%	7 31·8%	11 50%	22

Table IV gives an idea of the prognosis according to the duration of the disease It is very interesting to note that patients coming within a month of the onset of symptoms fare best, that patients with a history of 1 to 6 months are the most acute and that cases giving a longer history than 6 months have a better prognosis being more chronic in type The majority of cases that came under observation were in the groups giving a history of 1 to 6 months of disease symptoms, which indicated that pulmonary tuberculosis of the more acute type predominates in this country.

TABLE IV.

Comparative results of treatment of cases according to duration of disease in South India.

Duration.	Benefited.		No result.		Total.
One month and less	55	95%	3	5%	58
One to three months	89	75%	29	25%	108
Three to six months ...	80	72%	31	28%	111
Six to twelve months ..	77	78%	21	22%	98
Twelve to twenty-four months ...	53	79%	14	21%	67
Twenty-four months and above ..	73	88%	10	12%	83

It is not contended that the greater severity of the disease in India and the higher mortality amongst the tuberculous is due to a smaller degree of immunity either racial or hereditary in this country, where tuberculosis has been existent for centuries and any racial immunity that can possibly result from generalized infection has had sufficient time to be established. It is presumably the social, economic and food factor and possibly also the enervating climate that are responsible for the severer types of the affection and the higher mortality Poverty, insanitation, ignorance, early marriage and the tropical climate have each and all a part to play in this marked difference between the severity and prognosis of the disease in India and in the west, and the difference in the pathological localization in the lungs is most likely secondary.

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4. *Ibid.*—p. 235.

THE APPLICATION OF THE AGGLUTINATION PHENOMENON IN CLINICAL DIAGNOSIS.

By N SESHADRINATHAN, M B, B.S,

The phenomenon of agglutination was originally described by Gruber and Durham as early as 1896. They found that by this method a positive opinion could be given in all cases where the isolation of the causal organism by culture failed, especially so at a late stage' when it was absolutely impossible to cultivate the organism. Gruber and Durham worked with cultures of B. coli and Vibrio cholera. The reaction however is more often associated with the name Widal, who first applied it for the diagnosis of typhoid fever. Ever since, it has been one of the most reliable methods of diagnosing that fever It may be said that in no other condition is it so successfully applied as in the diagnosis of enteric fevers.

Agglutinins can be described as one variety of anti-bodies resulting from the reaction of the body to foreign cells. In the present instance, we are concerned with bacterial cells only. This antibody response cannot be described as entirely a defensive reaction on the part of the host. For it is found that the rise in the agglutinin titre is not always an indication of a corresponding rise in the antitoxic and other varieties of antibody response The effect of an initial course of two or three injections of a bacterial antigen into an experimental animal is to produce a high titre of agglutinins, whereas the subsequent injections may raise the protective power of the serum and not only do they not raise the agglutination titre, but it has on the other hand a tendency to lower it somewhat. The dosage to be employed to produce a high titre

serum, must be high enough to produce a severe reaction but not enough to kill the animal. The dosage to be employed for obtaining a protective anti-serum requires to be graded so as to produce the minimum reaction each time, in which the negative phase should be of very short duration. In some cases it has been found that the animal was nearly dying from the effects of the injection while the blood showed a very high titre of agglutinins In clinical observations it is found that a high titre of agglutination in an enteric case is often associated with severity of symptoms and fatality

The agglutinin formation in the host thus, appears to be a natural non-purposive response which may or may not beneficial to the host.

Agglutinins cannot be made apparent without the presence of saline (an electrolyte) This was first observed by Bordet who resolved clumps of agglutinated bacilli by washing them in distilled water and clumped them again by adding saline. Bacteria carry a negative charge under normal conditions The action of the agglutinating serum is to reduce this negative charge in the presence of an electrolyte The result is an alteration in the surface tension of the bacteria in the fluid, the bacteria are preciptated in clumps

Hence, there is a tendency to regard this phenomenon as a mere physical process The biological factor cannot be disregarded inasmuch as the property is specific for the particular species of bacterial cell.

Agglutination of specific spirochetes has been noted to occur in the sera of relapsing fever cases, but this is not used in diagnosing relapsing fever cases.

The adhesion phenomenon of Reickenberg may be regarded as similar in nature to the agglutination reaction. Here also there is something developed in the host's serum which has the power of altering the electrical charge of the antigen It may be that both this and agglutinins are identical. Here the organisms do not adhere to one another, but any fine non-specific microscopic particles such as bloodplatilets, bacteria, leucocytes (found to adhere to microfilaria in the plasma of filarial cases) may be made to adhere to the specific protozoal organism when placed in the plasma of a host infected with that of protozoon Trypanosomiasis and in relapsing fever, sera show this phenomenon. The identity of leptospira icteroides of Noguchi and L icterbæmorrhagica has been proved by this phenomenon.

Agglutination can be observed within a short time under the microscope, by mixing up varying dilutions of the suspected serum with the bacterial emulsion in normal saline This method is not now adopted owing to its liability to gross errors. The macroscopic method is now widely adopted For observing the reaction, either several hours incubation at 37°C or two hours incubation at 55°C after mixing the bacterial suspension with the dilutions of the suspected serum The temperature of 55°C does not destroy the agglutinins, since agglutinins are fairly thermostable.

There is a non-specific agglutination noted in certain bacterial emulsions which does not require any specific or normal serum for the reaction to take place Normal saline is found to be capable of producing the same The Rough Colonies of bacteria of Arkwright often exhibit this tendency to auto-agglutination In identifying a bacterium isolated from any case the possibility of

auto-agglutination should be kept in mind, and it is a safe rule to keep a control of saline emulsion of the bacterium in doing the agglutination test

Group agglutinins are exhibited to varying degrees by all agglutinating sera The response is dependent on the amount of group agglutinogens in the strain of the causative organism It is found to be the experience, that in testing for agglutinins in enteric fever cases varying degrees of agglutination for paratyphoid organisms are noted, in which the agglutinin titre for B typhosus is the highest, the cases are clinically positive typhiod and B. typhosus isolated from blood Group agglutinins are a source of trouble in the preparation of specific high titre sera A serum produced by inoculations of a pure strain of B typhosus gave rise to agglutinins for B paratyphosus B. to a very high degree Attempts at absorbing the non-specific agglutinins with B paratyphosus lowered the titre for specific agglutinins very much and rendered the same useless for practical purposes. The serum for B paratyphosus B. also behaved in the same way

The work of Andrews in differentiating between bacteria (Andrews work was concerned with the Salmonella group of organisms) possessing group agglutinogens almost exclusively from those possessing specific agglutinogens should enable the production of pure specific antigenic strains for obtaining specific agglutinating sera Andrews' work will also facilitate the obtaining of specific bacteria for indicating the amount of specific agglutinins alone in a serum sent for diagnostic purposes

In addition to the auto-agglutination there is another phase of the agglutination reaction in which specificity is not observed in the strict sense. but specificity of a

different kind is observed. This is the reaction known as Weil-Felix reaction obtained with the sera of typhus fever patients. Here the agglutination is exhibited by an organism (B proteus X-19) which is not the causative agent How this organism becomes enhanced in its agglutinability in typhus fever is not known, but the reaction is of great value in diagnosing most case of typhus fever.

Another property of agglutinins is that they can be removed by the specific bacterium from the serum. This property is made use of in diagnosing mixed infectious. It is also used in finding out whether an unknown bacterium isolated is a specific one or one allied to the group , or not belonging to the group at all.

Recent advances in bacteriology have affected the study of the agglutination phenomenon also. The discovery of S. and R. (Smooth and Rough) colonies marks a landmark in the study of bacterial variation. Arkwright (1920) observed these changes of appearance in the colonies grown from a single strain of an organism, while working with old cultures of the colon-typhoid—dysentery group of organisms In their agglutinating properties S and R colonies were found to shew marked differences R colonies agglutinated in small compact granules falling to the bottom of the tube S colonies agglutinated in large fluffy floculent clumps The R colonies tended to produce auto-agglutination in normal physiological saline. Arkwright found these two groups antigenically specific, *i.e.*, S colonies always produced sera possessing flocculating agglutinins and R colonies always produced sera containing compact agglutinins This altered behaviour of the two strains might possibly explain why in some cases of typhoid

fever agglutination of the ordinary type is not revealed, while clinically and by blood culture the cases are proved to be typhoid In such cases it may be assumed that the infection must have been with the R strain and the agglutinin response has been of the compact fine granular sedimenting type and so escaped observation

Weil and Felix were responsible for noting an apparently different kind of variation in bacterial cultures In investigating the agglutination of the strain B proteus 19 observed some difference in behaviour of typhus sera and sera from an animal immunised with B proteus X-19 Another difference was that the typhus serum produced fine compact agglutination, while the immunised serum produced large flocculating agglutinins This led them to the discovery of the 'O' type of B proteus colony and the 'H' type of B proteus colony. ('H' representing Hauch, meaning spreading, 'O' for one hauch, non-spreading). It is well known that usually motile bacteria tend to spread out in colony formation, and here the 'H' colony was found to consist of motile organism while the 'O' from non-motile organisms The 'O' type was found to produce fine agglutinins, while the 'H' type flocculating agglutinins They also found that the 'H' type of agglutinating serum contained two components, the fine granular as well as the flocculating This they found from the fact that the large flocculating component could be removed from the antigen by heating it to 80 °C or 100 °C, leaving the ability of the antigen to produce small granular type of agglutinins. The 'H' antigen was found to be heat labile, while the 'O' type was found to be heat stable. This differentiation somewhat corresponds with the 'flagellar' agglutinin and 'somatic' agglutinin observed by Smith and Reagh.

Yet another variation phenomenon was noted by Andrews working with the Salmonella group of organisms. His work revealed the existence of strains which shewed marked difference in behaviour in their agglutinability by specific sera and group sera. Some strains had maximum attraction for group agglutinins, and a trace of affinity for specific agglutinins. Others behaved in the opposite way. Andrews did not observe any 'smooth' or 'rough' variation in his colonies. (The R antigen has been found to be non-specific and the S antigen fairly specific).

There appears to be a close similarity observable in the three kinds of variants noted by the different workers as seen by their agglutinin production and agglutinating properties Professor Dibble in his Recent Advances in Bacteriology explains their probable identity by the observation that three sets of workers were dealing with the same at different phases of a single wide range of variation. This may be represented diagramatically as follows.

In the chart that follows the whole range of variation is arbitrarily divided into eight classes, and the range of variations noted by each observer is marked.

Arkwright's observations cover the widest range as seen by the S's and R's. Felix range falls short of observing the extreme on the right producing the rough colony, but he notes all the other characteristics of the rough colony. In the columns marked 5 and 6, all the three observers meet Andrews' type of Salmonella reacting antigenically to the non-specific group-agglutinins may be placed somewhere between columns 5 and 6; where roughness is not manifested in the colony, but the rough non-specific antigenic power is well manifest.

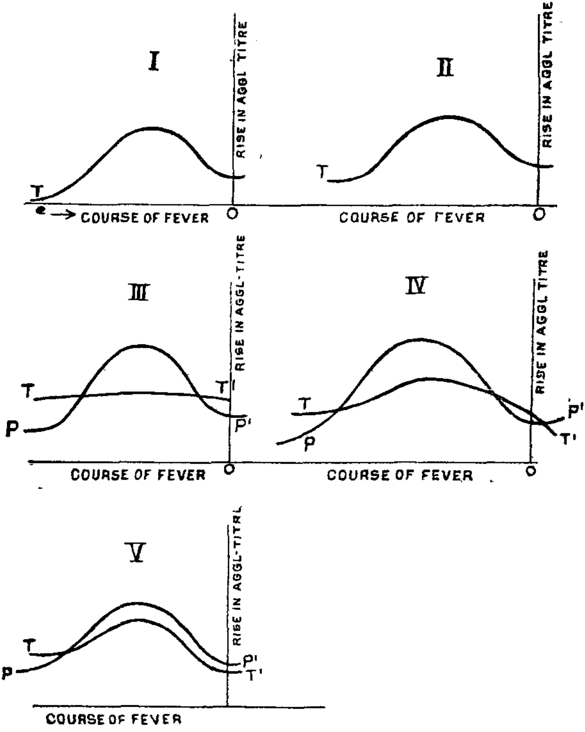
1	2	3	4	5	6	7	8
	←	←					
S''''	S'''	S''	S'	S			
		→	→				
	O	O'	O''	O'''	O''''	O'''''	R''''
			R	R'	R''	R'''	of Arkwright an extreme not noted by Felix
			→	→			
H''''''	H'''''	H''''	H'''	H''	H'	H	
		←	←				
	Smooth normal			Smooth variant S of Arkwright belonging to the O type of Felix.		Rough variant	

The marks' at the top of the variants H S. O & R denoting the progression of variation. The arrows representing the direction in which each worker observed most of his variations.

Andrews' group phase of Salmonella is to be found between variants 5 and 6 Where the Roughness is not manifested in the colony, but the rough antigenic power is well manifest.

Text-books describe several methods of doing the macroscopic agglutination test. The latest is Dreyer's method. For accuracy of technique and for quantitative estimation it is unique, but to be used as a standard in all laboratories for routine clinical work the test lacks a very essential quality, *viz.*, simplicity This is the reason why most laboratories do not use it A chief objection to the use of the usual qualitative test is that by this method one cannot detect enteric infections in an inoculated population and in mixed infections. This can be easily got over by putting up agglutination tests by the typhoid and all the para-typhoid organisms in each case with the serum to be diagnosed Any marked fluctuation or notable rise in the titre of the serum against one of the organisms, while the agglutinating power for the other organisms remains constant, is a valuable guide for diagnosis. Also by noting the curves of rise in agglutinating titre at different periods during the course of the fever one can find out whether the rise in agglutinating content is due to infection or to the inoculation. The following charts (charts I and II) shew the rise in the case of infection with B typhosus in the inoculated and the uninoculated. Charts III, IV and V shew the curves in the case of paratyphoid infections in the inoculated. These last shew the different ways in which the agglutination titre for B typhosus may vary in the case of the inoculated getting a paratyphoid infection It will be observed that the curve of the paratyphoid agglutinin is higher than that of typhoid agglutinin It is necessary in this case that the tests should be done by the same laboratory preferably by the same emulsion at different periods during the course of the fever, and to do the test with dilutions enough to include end points of the titre

Chart III, IV & V shew the curves in the case of Paratyphoid infections in the inoculated.



Felix has put forth the view that 'O' or small flaking agglutinins do not shew any increase in the inoculated, but shews a definite increase in a person suffering from enteric. This observation could be utilized in diagnosing enteric infection in the inoculated, by using 'O' antigen (which may be prepared by treating the ordinary 'H' antigen with alcohol) The correctness of Felix's observation has been questioned by Gardner

There is a fallacy likely to confuse the reading of agglutination tests, which is mentioned in all text-books known as the 'zone phemenon'. Higher concentrations may not shew any agglutination, while lower ones shew the change. This is very rarely seen in practice. It is said to be due to what are known as pro-agglutinoids possessing greater affinity for the bacilli than the agglutinins.

The practical applicability of this reaction in diseases other than the enteric group is very limited In cholera and bacillary dysentery, by the time agglutinins develop the disease will be found to have run its course. Detection of convalescent cases of dysentery and carriers of desentery are better done by macroscopic examination of stools as suggested by Col. Cunningham.

In undulant fever diagnosis by the agglutination test is fairly certain; but it is said that about 20% of cases do not give a positive result.

In tularaemia also positive results are obtained from the 2nd week onwards.

In typhus fever the reaction obtained is a non-specific one, the organism used being neither the causative agent nor a secondary invader. Positive agglutinations are obtained with as high a dilution as 1 in 500

The other uses of this test concern chiefly with the identification of an organism isolated from blood or other pathological fluids. The dilutions have to be put up to the maxinum titre of the specific serum.

The reaction is also made use of in typing preumococci and meningococci.

Agglutination reaction noted with other bacteria are at present of more of academic interest, than of clinical utility.

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ON BACTERIAL VARIATION.*

By Dr S RAMAKRISHNAN, L R C P. & S

(Professor of Bacteriology, Medical College, Madras.)

The idea of the permanence of characters in the animal world is at least as old as the question, "Can the Ethiopian change his skin or the leopard his spots?" but it is only in recent times that the fixity of animal species has been scientifically demonstrated Amongst the less highly organised structures of plant life, variation is of more frequent occurrence and though it is not possible to "gather figs from thistles" it is generally recognised that species in the case of plants are less rigidly defined than in the animal world In the realm of bacteriology still simpler forms are met with in which are recognised the beginnings of both animal and vegetable life, and amongst these, variation may vary naturally be expected to be of still greater frequency. But curiously enough, systematic bacteriology is mainly based on the conception of fixity of bacterial form and characters, and the possibility of variation among bacteria has been generally discredited by a majority of practising bacteriologists To a considerable extent, this conception of the conservation of Bacterial types is an inheritance from Robert Koch and his disciples whose exact work and outlook demonstrated the erroneous nature of the very wild speculations about variational phenomena that were postulated in the early days of Bacteriology. In this way, arose the conceptions of "normal colony" and "normal bacterial morphology"

* Being the substance of a readerships' lecture delivered under the auspices of the University of Madras.

which have never ceased to influence both bacteriological thought and practice. The usual procedures adopted in all laboratories tend to emphasize uniformity. The standardised artificial media select those organisms, I should say those phases of the organisms, which are best fitted to grow under saprophytic conditions, the crude drying and flaming methods of fixation and gross overstaining effectively conceal any fine differences in structure ; the daily rotation of the earth gives us a standard time for the examination of the cultures based on our convenience, rather than on any physiological cycles in the development of the bacteria. And if still unusual forms are seen, what can be easier to the medical bacteriologist than that these are "involution forms", "degeneration forms", artefacts or "contaminants"? These degeneration and involution forms have served even to the present day as the final repository for all forms of bacteria which depart from the expected normality

But from the earliest days of the Science certain observers were impressed by the evidence of Bacterial instability and refused to be coerced to the acceptance of the dogma of rigid bacterial types of Koch and Cohn. An extremist of this school was Nageli who assumed wide powers of transmutability in bacteria. For him the fission-fungi represented only a single type of cell highly variable and capable of passing from one morphological state to another as well as capable of undergoing profound alterations in biochemical behaviour and fermentative capacity He could easily conceive cocci becoming rods and rods cocci or spirals, forms of growth change overnight, motility lost and regained; fermentation reaction modified by time and opportunity; sporeformers become sporeless; hæmolytic activity to come and go; capsulated bacteria lose their capsules, and

capsules gained by non-capsulated, virulent cultures become harmless and harmless cultures virulent. Possibly, it was fortunate for the development of Bacteriology in its earliest stages that these extreme views gained no currency; Robert-Koch's position and influence prevented chaos and allowed the science to grow on sound utilitarian lines which medical progress has demanded. Nevertheless, some writers were tenaciously holding on to the conception of Bacterial Variability, although perhaps not to the extreme view held by Nageli. Their observations did not evoke any general interest or the acceptance of the fact of bacterial variability even in a relatively minor degree, until about 1906 when Neiss er and Massini published their observations on the ' mutations" of a strain of B. Coli which they termed B Coli mutabile.

This strain of B. Coli which was isolated by Neisser from a case of enteritis failed to ferment lactose when planted on an Endo-plate except under the following conditions when the plates were left at 37°C for from 72-96 hours "Red" daughter colonies appeared in the "white" non-lactose fermenting ones On transfer to a fresh Endo plate these Red colonies promptly formed acid and bred true, while the white margins of mixed colonies or the "all-white" colonies yielded non-lactose fermenting colonies only, (except when they were allowed to age and transfers made from the daughter colonies as described above). These observations of Neisser and Massini were too clearly significant to be brushed aside. (They were confirmed by Cowelenco (1910) who took the precaution to work with single cell cultures)

Their observations were quickly confirmed and extended to other species by various workers. Frequent

citations are noticed in the literature, during the years following, of similar observations of "mutations" or "mutation-like" phenomena among bacteria; instances of variation in morphology, in biochemical properties and fermentive capacity and serological properties. Many bacteriologists began to admit the existence of some sort of Bacterial variation, began to recognise wide and apparently permanent departures from the long assumed constant "normal" type But it may be said that in many instances these observations were not recognised even by the authors themselves as being related to the general problem of mutation; they were simply cited as unusual or curious phenomena Probably amongst the most serious studies of this period were the work of Eisenberg (1914) who attempted to analyse the various types of variation and to classify them according to their significance—modifications, fluctuations and permanent changes—and that of Baerthlein (1918) on colony variation and correlated features of common bacterial species, each analysed with a wealth of detail. Baerthlein's method of producing variants was to grow the organism in both culture for several days at the incubator temperature and to plate from this ageing culture at intervals, a method which is still largely followed by most workers The most important fact clearly established by his exhaustive and detailed treatment is, that colony variability may always serve as a criterion of cultural variability and that with various colony types are corelated other highly important characteristics of the organism including individual morphology of the cells, pigment production, slime production, fermentation reaction, serologic reactions, and virulence

General interest in the problem really dates from the publication by Dr. Arkwright in 1921 of his oberva-

tions on variation in intestinal Bacteria. Arkwright was probably the first investigator to recognise the fundamental significance of Baerthlein's contributions. He recognised among the many colony variants reported by Baerthlein two which were of special significance; and these he was able to identify in the case of many organisms of the Colon-typhoid-dysentery group On agar plates one type of colony had a smooth, glistening surface, was raised, dome shaped and round, with smooth regular well defined margins, they were transculent and when examined with a low power of the microscope appeared quite smooth or only very finely granular. This he called the "S" (smooth) variant The colonies of the other type, in their most characteristic form were larger than the "S" colonies, flat and thin, with a slight central boss and jagged or irregular margin, the surface was coarsely granular, this he called the "R" (rough) variant. These two types were found to occur in B. dysenteriae (Shiga), B. dysenteriae (Flexner), B typhosus, B. paratyphosus, B. and B enteritidis gaertner; although both types of colony could not be obtained in every instance. Correlated with the change in colony form he found certain profound changes in the characters of the two types, of which he laid the greatest emphasis on the behaviour in Salt solution The most obvious distinguishing characteristic of the "R" form is the property which emulsions possess of forming clumps and precipitating in 0 85 per cent NaCl; while the "S" form formed a stable emulsion in this strength of NaCl. Related to this property is the appearance of Cultures in liquid media Cultures of "R" form in ordinary nutrient broth or peptone water produce a deposit at the bottom leaving the liquid above clear, instead of making it uniformly turbid as do cultures of "S" form This pre-

cipitation of the bacteria in the culture tube is due to the salt content of the medium, for if the broth is diluted with distilled water to one-half or one quarter of its original strength, or the medium is made with less salt, the growth of the "R" form also causes uniform turbidity with little or no deposit. Certain differences in the morphology of the individual Bacteria could also be noted The individuals of the "R" type were usually rather wider and had rounded ends; and in the case of motile bacteria, motility was often reduced or absent in the "R" type. A marked difference in the type of agglutination with specific serum is noted. The "R" form is agglutinated in small compact granules falling to the bottom of the tube whereas the "S" form is agglutinated in large flocculent clumps Agglutination tests were carried out with emlusions of the organisms in distilled water. Arkwright was probably the first investigator in evolving this technique of specific agglutination tests in the case of "spontaneously agglutinating" strains, a mode of procedure which has been amply exploited in later investigations by other works Arkwright further showed that the appearance of the agglutinated deposit was quite characteristic of true agglutination as regards its distribution over the concave bottom of the tube and as distinguished from the deposit in normal saline in which the unagglutinated bacteria are collected in a very small compact mass at the centre of the concavity.

In addition to these properties, Arkwright found there were corresponding differences in agglutination tests. Whereas both types agglutinated to titre with stock laboratory agglutinating serum, with monovalent sera prepared with each type separately each seemed antigenically specific there being little cross agglutination.

The "S" and "R" types were also noted to preserve their individuality to a considerable degree when kept regularly subcultured. He also noted that the "S" forms obtained from several strains of B dys (Shiga) resembled each other serologically but were distinct from all the "R" forms, while the "R" forms of different strains appeared to have little relation to any "S" form but to be closely related to each other. In other words, from several strains of B. dys. (Shiga) he was able to isolate two types from each strain, which seemed to behave as if they were two distinct organisms.

It will be convenient here to refer to the work of Weil and Felix (1917) who awakened a new interest in B proteus by reporting certain observations on variation in connection with their study on its possible role in typhus fever. They reported the spliting of their culture of B. proteus X-19 into two chief types to which they gave the terms H and O The H form which appeared to be the normal, grew on solid culture media with the characteristic broadly spreading film (*hauch*), while the "O" variant grew in isolated discrete colonies without spreading (*ohne hauch*) In agglutinating serum, the "H" form clumped in large loose ("*grob*") flocculi easily dispersed by shaking The "O" form on the other hand agglutinated in small graunlar ("*fein*") clumps. It was later shown by Sachs in 1918 that the "H" antigen was destroyed when heated at 80°—100°C for one hour, flocculent agglutination in presence of immune serum, no longer occurred although some fine clumps were observed By a similar treatment the "O" was not altered; it still agglutinated in fine clumps These antigenic modifications were soon confirmed by other workers In view of these results, Weil and Felix concluded that normal Proteus cultures possessed two antigenic groups or receptors, "H" which

was heat labile and "O" which was heat stable, while the 'O' variant had but one the, heat stable Similar antigenic groups were observed in B typhosus and B para-typhosus and subsequently in many other species.

An attempt was made by Arkwright and Goyle (1924) to correlate their "S" and "R" forms of intestinal bacteria with the "O" and "H" forms of Weil and Felix As stated earlier the suspension stability in 0·85 per cent of NaCl was taken as the criterion of "S" and spontaneous agglutinability that of "R", resistance to heat as the criterion of "O" and destruction by heat that of "H" antigen They concluded that the presence of two kinds of antigen could be proved by demonstrating that the type of agglutination was changed after heating an emulsion at 100°C for 10 minutes and the heated emulsion would absorb one agglutinin but not the other, and could be used in obtaining a pure agglutinating serum They also stated that variants could be obtained in which only one antigen was demonstrable. But regarding the identity of their forms with Felix's, they came to certain erroneous conclusions which were opposed to the trend of other evidence Bruce White (1925) investigating the matter afresh showed Arkwright and Goyle's conclusions were based on a fallacy namely that their so called "S" type used in those experiments were obtained by growing stock cultures on phenol-agar, a method, used by Braun and Schaeffer in 1919 for the production of "O" type of B proteus X-19. He also showed that the rough variants contained in addition, a heat stable antigen, peculiar to the rough forms, for which agglutinins were present in the sera made with the rough, but not in those made with smooth forms White showed that smooth cultures normally exhibit both "H" and "O" antigens of which the former is the more obvious in tests with the

Salmonella, but under certain conditions, as growth on phenol-agar the "O" property comes to the fore; and the culture at this stage should be called "O" smooth Roughening is therefore concerned with the fundamental change in the "O" antigen from O-smooth to O-rough; and this is associated with a reduction or total loss of "H" antigen; when the loss is complete, a characteristic heat stable component R becomes evident. The trend of dissociation would thus seem to be S—>O—smooth—> O—rough—>R

In 1926, Goyle published "certain observations on Bacterial variation with special reference to the alleged convergent phenomena exhibited by certain distinct pathogenic species (B typhosus and B enteritidis, Gaertner)." This represented the results of a detailed study by direct agglutination and absorption methods of the three forms of B. typhosus and B enteritidis. These three types were :—

(1) Smooth form, Normal *i.e.*, Normal stock cultures containing 2 antigens (similar to those of H culture of Weil and Felix) the heat-labile "H" and the heat-stable "O".

(2) Smooth form variant, produced by growth on phenol-agar containing ordinarily only a single antigen, O (heat-stable) but sometimes also R

(3) Rough variant, produced by plating out old broth cultures, containing mainly the heat-stable R antigen, but often some of the heat-labile, smooth H found in normal smooth cultures and sometimes according to White some "O" antigen

All these were employed unheated for the production of immune rabbit serum. All the immune sera

were tested against all the antigens by agglutination and absorption methods, and as a result, he correlated the H antigen of Weil and Felix with the normal or S form and not with " R " as originally set out by Arkwright and Goyle (1924) Moreover, the " O " type of Weil and Felix was shown not to be related to the " S " as was first stated by them, Arkwright and Goyle, but to be an independent antigenic type essentially different from both S and R forms Arkwright's R seemed to be a further stage in variation than anything which was reached by Weil and Felix. In this view, there are two types of heat-stable antigen, the " O " type of Weil and Felix and (present in a marked degree in phenol derived cultures) an R type present only in the " R " type giving rise to what he calls the muddy type of agglutination In his experiments he found that this " R " antigen was non-specific in the sense that it reacted both with B. typhosus and B. enteritidis in suitable phases It is very reasonable to assume that these are the antigens responsible for the phenomena of group agglutination.

This view of the three types of antigen, *viz.*, " H", " O " and " R" has since been adopted by Arkwright (1927) Starting with a strain of B paratyphosus A. recently issolated from the feces of a carrier, he was able to obtain the following variants, which were quite distinct and could easily be distinguished in broth cultures These forms were (1) smooth and highly motile, (2) smooth and non-motile, (3) rough and motile, (4) rough and non-motile The smooth and rough colonies were distinguished by the appearance of colonies on agar and broth cultures, and agglutinability in salt solutions Agglutinating sera were made from the 4 variants and tested with these 4 types of antigens The serum from (1) contained H and

O-smooth agglutinin; from, (2) contained only O-smooth agglutinin, (3) had H and R agglutinins, (4) had only R agglutinin. He was able to demonstrate that the 2 motile forms, *viz*, smooth motile and rough motile cross-agglutinated when the emulsions were unheated in virtue of the H antigen being common to both, and the 2 smooth forms, cross agglutinated whether the emulsions were heated or not by reason of their having the "O" heat stable antigen The two R forms cross agglutinated whether the emulsions were heated or unheated because both contained the characteristic R antigen, which was unaffected by heating or only to a minor degree. Heated emulsions of S and R never cross agglutinated and the non-motile S (=O of W. and F) never agglutinated with an R serum, nor the non-motile rough with an S serum.

By this careful antigenic analysis of variant paratyphosus colonies, he could associate, the heat labile "H" agglutinin with motility or flagellum its anatomical counter part; and recognised two types of agglutinins related to the body of the bacterium, one of which was characteristic of the non-motile smooth state; and the other with the non-motile rough state. This matter is well summarised in the following table slightly modified from his paper

Antigen or factors	Heat—labile or stable at 100° C	Flagellar or somatic	Serum agglutination	Salt agglutination	Present in variants
H	Labile	Flagellar	Large flocculi	—	S M & R M
O	Stable	Somatic	Small, granular	—	S M & S N M
R	(Stable)*	Somatic	Very small, muddy	+	R M & R N M

* The R is less heat-stable than the O in some species

S M = Smooth motile
R. M = Rough motile
S N M = Smooth non-motile.
R N M = Rough non-motile
S = Smooth variant.

In a later communication (1927) to the Pathological society of Great Britain and Ireland he has collected the evidence indicating the existence of distinct flagellar and somatic antigens and agglutinins (which Smith and Reagh were led to postulate as early as 1903 as a result of their observations on agglutination with two strains of B suipestifer, a motile and non-motile). He has summarised the evidence as follows —

(1) Two different kinds of macroscopic clumps are produced by the action on motile and non-motile forms respectively, with serum made against the motile form. An unheated emlusion of the motile form agglutinates in large loose flocculi, whereas the non-motile variant, forms only small clumps. Similar clumps can also be detected in an agglutinated smooth emulsion in addition to the large flocculi.

(2) The motile form after it has been heated at 100°C only agglutinates in small clumps like the non-motile form whose manner of clumping is unaffected by heat.

(3) Rabbits inoculated with an unheated emulsion of motile bacteria yield serum which can bring about both kinds of clumping.

(4) An emulsion of a completely non-motile variant or of the motile form which has been heated at 100° for 1 to 2 hours as a rule produces in rabbits only small-clumping agglatination.

(5) By shaking and centrifuging emulsions of motile bacteria clear extracts can be obtained containing many flagella and very few bodies of bacteria. In such a liquid on the addition of serum *versus* the whole

bacteria, only loose flocculi are formed and no sign of granular somatic agglutination is seen. Injection of this flagellar emulsion into rabbits produces flocculi-forming agglutinin. Moreover the agglutinable substance and the antigen are heat-labile at 100°C.

(6) It is possible to produce separately flagellar or somatic agglutination of the same emulsion in various ways, by using different agglutinating agents.

(7) The two kinds of agglutination produced separately when observed microscopically have the following characteristics :—

(*a*) If flagellar agglutination of a living culture is watched in a hanging drop, the bacilli are soon seen to cease moving about and to collect gradually in loose clumps with clear spaces between the individual bacilli. The bacilli no longer move so as to change their place, but only dance with a movement which is probably chiefly Brownian Gradually the clumps get denser

(*b*) In purely somatic agglutination, the appearances are fundamentally different At first small and then large clumps form, made up of bacilli which are closely coherent by their surfaces, but unclumped bacilli and small clumps continue to swim about,

The events in the 2 cases are as follows. With a flageller agglutination, the flagella become coherent and hampered in their movements, individuals in the clumps are held together by cohering flagella but the bodies of the bacteria do not lie touching, and at any rate, for some time they may dance at the end of their tether. On the other hand, when somatic agglutinin is in operation, the surfaces of the bacteria cohere, but the

flagella on those surfaces which are not touching the neighbouring bacteria are free, and move vigorously thereby bringing about the translation of the clumps. It should be noted, however, that this assumption of the identity of the heat-labile and heat-stable antigen with the flagellar and body substance of the bacteria is not applicable to all cases, since it has been amply proved that several non-flagellated organisms also possess a double antigenic complex, like the pneumococci and B. friedlander and B dysenteriæ

Gentlemen, I have reviewed the literature on this aspect of Bacterial variation, *viz.*, antigenic analysis especially as observed with the organisms of the colon-typhoid-dysentery group at some length, because the different nomenclature adopted by various workers, and the inaccurate and inadequate early descriptions led to many contradictions and confusion of thought. Besides these observations have stimulated similar study in other fields by other workers.

For closely following Arkwright's first paper here reported, his findings were confirmed for certain other species. Cowan (1922) demonstrated smooth and rough variants among Strepto-cocci and also found R variants were devoid of pathogenicity Griffith (1923) and later Reimann (1926) produced rough variants of pneumococci types I, II and III by repeatedly growing pneumococci in broth containing 1 per cent immune serum and selecting colonies from plates poured out of these. Immune sera were prepared with degraded or variant forms of pneumococci (R strain) and Reimann noted R forms regardless of type derivation were serologioally identical; paralleling Goyle's observation on the convergence of B typhosus and B. enteritidis in their Rough form:

Comparing the reaction of S and R forms of pneumococci with "S" and "R" antisera, and with sera prepared for the proteins of pneumococci and the specific carbohydrate substance of the 3 types, he was led to conclude that the degraded form (R form), had the antigenic characters of the pneumococus protein, they evoke species-specific and not type-specific antibodies Anti-pneumococcus sera obtained by immunisation with "S" strain may contain species-specific antibodies in addition to those which were type-specific; each kind of antibody could be removed separately from these sera by selective absorption with R or S strains of pneumococcus, the double antigenic complex of the normal pneumococus was then demonstrated.

Topley and Ayrton (1924) investigated the matter in B. enteritidis (aertrycke) and recognized the same smooth and rough forms. Bruce White (1925) reference to whose work has already been made, made similar observations over many of the Salmonella and Baltenaue (1926) on the cholera vibrio

Another important aspect of variation relates to the oscillation in the character of virulence in pathogenic bacterial species Probably the most classical observation in this direction was that of Pasteur in 1881 who, by exposing Anthrax bacilli to a high temperature produced a permanent modification of their character obtaining a race of diminished virulence which was also associated with certain changes in the cell morphology and other characters. But the first investigator to demonstrate clearly the relation of virulence to bacterial variation was de Kruif. (1921). He studied the subject in B lepisepticum (Bacillus of rabbit septicæmia) a highly virulent species of the Pasteurella group. He was

able to recognise two types which he called D (fully virulent) and G (non-virulent). These corresponded to the S and R forms of growth of Arkwright; they presented similar difference of growth upon solid media and in broth. The two types were remarkably permanent in culture; but working with single-cell cultures he succeeded in demonstrating that rough varieties were formed in ageing cultures. He made the important observation that the virulence of a culture was a function of the proportion of the S bacteria in it and not as has been widely believed, due to a general raising or lowering of the virulence of each organism. In other words, lessened virulence does not mean a similar fractional loss by each and every organism in the culture, but a dilution of the number of virulent bacteria (S) by an increasing number of bacteria possessing no virulence (R); virulence was an attribute of the D (S) type.

Among the Salmonella, Arkwright found virulence was associated with the smooth strains, the roughs being very deficient in this quality. In the case of the paratyphosus A, which he obtained in 4 forms, SM, SNM, RM, and RNM, the virulence was related to the smoothness and not with the motility. Indeed, he was inclined to believe that the smooth non-motile form (corresponding to "O" form of Weil and Felix) was rather more virulent than the smooth motile form Weil and Felix found that the "O" form of Proteus X-19 was the more virulent for rabbits In both hæmolytic and viridans type of Strepto-cocci Cowan (1922) established the association of greater virulence with the "S" type She however, thought that the R type was not apparently destitute of virulence When the injections were not fatal, abscess formation usually occurred, and these

seemed to play a part in the production of Immunity. It is just possible that her R type contained mixtures of "S" as she was mainly working with broth cultures, which are known to permit variations more freely. Griffith (1923) who was the first to demonstrate the two chief types R and S in pneumococci also established the strikingly virulent character of the "S" and the non-virulent character of "R", which failed to kill mice in doses of 0 25 cc. whereas "S" cultures were fatal to mice in such a minimal dose as 1×10^{-8} cc. in 2 days. Griffith pointed out that the S form produced the pneumococcus specific soluble substances, while these were lacking in the R strains This work was confirmed by Reimann and Amoss in 1925.

A consideration of these and similar observations leads one to believe that virulence is dependent on certain definite phases or stages of cultural growth; and that a fully virulent and an a-virulent organism may exist side side in the same culture (de Kruif) It appears exaltation of virulence is dependent upon the increase in relative frequency of the S type organism over the R and conversely that attenuation of virulence involves the increase in relative frequency of the R type over S. The significance of the restriction of virulence to one stage of the organism (the stage which is called "Virostaduim" by Enderlein) is of some importance in medicine.

Considerable interest, naturally, attaches to the immunising value of the different variants De Kruif thought that a very high degree of immunity could be produced in rabbits by injections of "G" (*i e*, rough and non virulent) type of B lepisceplicum against fatal doses of virulent cultures Cowan (1924) found that the R type of Streptococcus, which was less virulent than

"S" when injected intraperitoneally into mice, gave considerable protection against the later injection of the "S" or virulent type of the homologous organism. Heat-killed R and S types in some cases produced a certain amount of Immunity against the "S" type She pointed out, however, that in Rabbits at least, the "S" type given subcutaneously produced immunity in a much larger per centage of animals and the production of agglutinating anti-bodies was greater when the "S" type was given than when the "R" type of the same strain was given, though protective value of a vaccine bore no direct relation to the agglutinin content Griffith working with pneumococcus found that serum of rabbits immunised with "S" type exerted considerable protective power on mice against subsequent injection of fatal culture, when as little as 0 2 cc of the "S" serum was administered with the infecting culture. Under the same conditions of infection, however, the R antiserum showed no protective power Balteanu (1926) during a study of the H and O antigens of V. cholera concluded that an opaque variant, which is probably the "O" form and which he had previously shown to be less virulent gave as good a protection as the normal

Arkwright (1927) investigating the relative value of vaccines prepared from the variants of B. typhosus and B paratyphosus A came to the conclusion (1) that vaccines made with the R form gave comparatively slight protection and (2) S forms made efficient vaccines, "S" vaccine consisting of emulsion in distilled water containing 0·1 per cent phenol whether killed by heating at 53°C. for 70 minutes or at 100° C. for 30 minutes gave just as good protection as those only just heated at 53°. Commenting on these findings, he points out that the first

conclusion is represented in the general belief regarding the inefficiency of old laboratory cultures and especially non-virulent ones for prophylactic inoculation He draws attention to the work of Griffith (1922) and Heidelberger and Avery (1924) and Reimann (1925 and 1926) on pneumococci, where changes which were at any rate superficially analogous to "roughness" in the typhoid coli group, were undoubtedly associated with loss of virulence and loss of immunising power. Cowan (1923) also recorded similar facts for pathogenic Streptococci The second conclusion, that exposure at 100°C for 30 minutes did not impair the efficiency of the vaccine seems at first sight, surprising in view of the long standing opinion, that a vaccine is more efficient the lower the temperature at which it has been killed. But when it is remembered that Arkwright had previously associated the "O" smooth heat-stable factor with the maximum virulence, the conclusion is not so surprising after all.

The importance of the "O" or heat-stable antigen in immunity has also been largely stressed by Felix. Starting with the finding that in Weil Felix reaction the agglutination of the proteus X-19 by the blood serum of typhus patients was entirely of the "O" or compact granular type he was led to investigate the significance of the type of agglutination in enteric cases The significance of the Widal test in the diagnosis of enteric especially among troops and the civil population in war areas was greatly lessened as a result of the almost universal adoption of the T A B prophylactic during the Great War. The usual methods of performing the test the Dreyer technique included—were inadequate for distinguishing between the inoculation agglutinins and infection agglutinins in persons who had previously been inoculated.

Felix and Olitzky, however, detected a qualitative difference in the type of agglutination, as the result of inoculation, and that due to infection, the former was of the large loose floccular type, (*i.e*, H type) while the latter was of the fine granular "O" type. Felix even allowed himself to doubt the prophylactic value of the killed antityphoid vaccine as ordinarily administered because no "O" agglutinins were produced.

Sufficient evidence has, here, been presented to show that variational phenomena among bacteria are by no means rare nor are they devoid of interest. We are still largely ignorant of the mechanism of variation—most of the instances above referred to have been observed as occurring "spontaneously" or have been the incidental or accidental results of endeavours having some other purpose in view. A change from the "normal type" may be brought about by ageing cultures, altering the nutritional environment, growing them at other than optimum temparature or in the presence of chemicals or in homologous immune serum. The properties of "roughness and smoothness" seem to be the most convenient indications of change and together with this change are noticed alterations in the morphology of the cell, its motility, fermentative power, virulence, antigenic capacity and serological independence. In a general way the trend to variation seems always to be in the direction S—>R leading towards a simpler and more vegetative type of organism. This aspect of Bacterial dissociation is a normal, and apparently spontaneous, phenomenon.

Of recent years we have obtained a new and more powerful incitant to Bacterial variation than any we knew before, I mean, the Bacteriophage. Bacteriophagy or 'transmissible autolysis' as Bordet would call it, has

a common meeting ground with the problem of microbic dissociation in a single aspect of physiologic behaviour—namely the instability of bacterial culture in its reproductive function In Bacteriophage, one has the means of producing changes in culture types, for the occurrence of which one had formerly to wait a long time, patiently selecting colonies from plates poured out of ageing broth cultures, picking out any that seemed to differ from the normal and repeating the process to accentuate the degree of variation Thus it has been noted from the very earliest observations of D' Herelle and Bordet that " mutating" culture types originated under the influence of the lytic agent. When the Bacteriophage in appropriate concentration is added to a young broth culture of the sensitive organism, lysis takes place within 3 or 4 to 24 hours, and *most of the bacteria are apparently destroyed. But* some clearly survive. After some days these may give evidence of new growth and produce a fresh clouding in the medium *This represents the secondary or resistant* culture It resists the action of the same bacteriophage but not necessarily of another strain of bacteriophage. Similar results in the production of secondary cultures may be obtained on solid culture media. These secondary cultures are often of the type we have called " R ". It would be a misapprehension, however, to think that all " R " type organisms are resistent to Bacteriophage. Arkwright (1924) working with 6 strains of B. dysentery (Shiga) and a strain of bacteriophage came to the conclusion that phage-sensitive colonies appeared spontaneously in old normal culture of resistant strains ; he noted that the production of variants by phage action was a very conspicious feature of the Twort D' Herelle phenomena and that the variants obtained by phage action and with-

out the addition of phage were very similar. He concluded that the relation of special spontaneous variants, variants in both to phage, supports the identity of the stimulus evoking cases

This view has been vehemently opposed by D'Herelle himself who considers Bacteriophage as an independent living entity, an ultramicroscope organism, capable of serially propagating itself in subcultures like the micro-organisms one knows of, and like them, capable of being enumerated in liquid media It is outside the scope of this paper to enter into the controversy regarding the nature of Bacteriophage, but one might say D'Herelle's views have largely been accepted. Dr. Asheshov, (1930) who accepts D'Herelle's view of the living nature and specificity of the Bacteriophage has found among strains of cholera-phage 3 types, A. B. C. each of which by itself is unable to cause complete lysis of cholera cultures without giving rise to secondary resistant colonies, but together cause total bacteriophage. Here one sees the possible relations between the types of cultures, one has spoken of as " S " " O " " R " and types of Bacteriophage A, B and C. The matter is still under investigation, a better knowledge of the phenomena of bacteriology may enable one to understand the nature of bacterial dissociation.

The present knowledge of bacterial variation, scanty, though undoubtedly it is, has already found a wide and useful application in the realm of Applied Bacteriology. Reference has been made to the serological difference of the variants and their bearing on the diagnostic procedures based on serological methods. One gets an insight into those cases of so called " clinical enteric" with persistent negative widal reaction—

negative that is, as far as the old methods of performing the test went. One has been enabled to perfect technique which could distinguish inoculation agglutinins from those due to infection and render a diagnosis of enteric possible among the inoculated.

In the field of prophylactic inoculation greater advances are likely from an appreciation of the fact that immunising value of a vaccine does not lie equally distributed through all the phases of the culture of an organism, but is greatest, in the majority of bacteria studied, in those phases one has designated smooth or " O " and least or absent in " R ".

As regards the evolution of bacterial diseases and the rise and decline of epidemics, one could speculate that these are associated in some way with the changing cell type during the course of the disease or the epidemic. In the field of protozoal infections Rieckenberg (1917) employing the serological reaction now known by his name could demonstrate differences between the starting and relapsing strains of Trypanosoma brucei in Trypanosoma infection of rats. In Spirochetal infections, Cunningham (1922) employing agglutinative methods as observed under the dark ground microscope observed alternations of serologically different races of the Relapsing fever Spirochacte in the attack and relapse strains serially propagated and kept in culture in squirrels In bacterial diseases atypical variants of the common pathogenic organisms have frequently been encountered in the carrier state or under the influence or drugs. Thjotta and Eide (1920) isolated a mutating mucoid variety of paratyphoid bacillus from the urine of the carrier and Fletcher (1918) from the stool of a carrier. Thjotta and Eide observed the cultures of

the urine contained very few typical colonies, when the variant appeared; particularly interesting is the observation of Melon (1925) who isolated a strain of the B Coli from a case of Pyelitis in which it grew with such pleomorphism as to suggest a fungus. He showed that the remarkable pleomorphism was quite dependent on the fact that the patient had been taking urotropin and sodium acid phosphate at the time. Taken off the drug her urine yielded nothing but normal looking B Coli. By exhibiting the drug or withholding it, he could produce at will either the atypical or normal looking B. Coli. Wadsworth and Sickles (1927) in a study of pneumococcus isolated from horses undergoing pneumococcus immunisation found the organisms multiplying in the tissue of the immunised animal were of the degraded ("R") type. Reimann (1927) experimantally produced degradation of pneumococcus by embedding cultures of "S" type of the organisms in agar enclosed in vials subcutaneously in rabbits. These observations lead one to think if it should not be the aim of therapeutic endeavours not always to attempt to destroy the circulating organisms which in many cases is beyond the possibility of drugs or other therapeutic measures, but so to affect invading pathogenic organisms as to alter thieir phase in their developmental cycle and assume the non-virulant degraded "R" type and naturally eliminate themselves

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THE IMPORTANCE OF SYSTEMATIC EXAMINATION AND ITS VALUE TO THE CLINICIAN.

BY M. NARAYANA PAI, M.B. & B S.

(*Department of Pathology, Medical College, Madras*).

It is hardly necessary to point out the value of a systematic examination of the patient and his urine, faeces, blood, sputum, etc.. in every case met with either in hospital work or in private practice. In hospital practice, especially in teaching institutions it not only makes the diagnosis more certain, but it also trains the students in being systematic Time and again, cases have come under observation when clinical examination has not revealed anything of importance but a cursory examination of urine, motions, blood or sputum has shown the true state of affairs. A case sheet worth writing is worth preserving, for, a complete and exhaustive case-sheet is indeed a document in itself.

In private practice it is even more important as the reputation of the doctor depends upon the correct diagnosis and moreover such examinations gain the confidence of the patient and relatives, for, nothing satisfies a patient more than a thorough and systematic examination

Further, in conditions such as diabetes mellitus, chronic interstitial nephritis, toxæmias of pregnancy, etc., not only can the progress of the patient be watched but also more accurate prognosis can be estimated

The following cases which have come within my personal experience and knowledge will serve to illustrate the statement.

The first case was one of pain in the abdomen, about which the patient was very vague. His history was that the pain was in the region of the umbilicus, not altered on taking food, with occasional nausea and vomiting His appetite was poor, he had no history of fever, bowels were regular and he had no difficulty in passing urine. A casual examination of the heart and lungs revealed nothing abnormal. McBurney's point was slightly tender, but the patient was very vague about the pain. The duration of the symptoms was about 2 years The urine was examined and nothing abnormal was stated to have been found but a centrifugalised specimen was *not* examined microscopically The case was posted for operation On Laparotomy no gastric or duodenal ulcer was found, the appendix and gall bladder were normal Appendicectomy was however done On the 5th day after the operation, however the patient complained of increasing pain in the abdomen; the operation had increased the pain, instead of relieving it. On examination of the urine microscopically epithelial and granular casts and pus cells were found. The specific gravity was higher than normal and there was a fair amount of albumen. On close interrogation of the patient, he gave a history of swelling of the face and slight retention of urine, about 3 years back The case was evidently cystitis and pylonephritis and a thorough examination of the patient's urine would have revealed the condition. No operation would have been done and the patient saved.

The second case was a female, of about 40 years; fairly well built, not anæmic, bowels regular and no complaint about the urine, she complained of debility nausea, occasional vomiting and giddiness She could not do her usual household work without a certain

amount of exhaustion. Her temperature, heart and lungs were normal. The pulse was about 90 per minute the liver and the spleen were not palpable. A provisional diagnosis of helminthiasis was made but two separate examinations of her motions did not reveal a single ovum of any worm. On examination of the urine however it was alkaline and there was plenty of albumen, granular and hyaline casts and phosphates A strict course of diet was observed and the patient was given purgatives, Hexamine and Acid Sodium phosphate, with the result, that within two weeks considerable improvement followed. Examined only clinically the condition would have been diagnosed and treated for worms only but a microscopical examination revealed the condition to be one mainly of the kidneys.

* The third case came to my notice in the surgical wards where a patient was admitted for diabetic gangrene of the foot. On admission he had about 3·5% sugar in the urine and plenty of acetone bodies and a trace of albumen. The blood sugar was about 0·2% The estimation of the sugar in the urine was done every day and insulin was injected, from about 20 to 40 units a day depending upon the percentage of the sugar in the urine. The foot was amputated and the patient stood the operation well Insulin was continued after the operation and the urine sugar was maintained at a low level of about 0·5% On the 5th or 6th day after the operation, due to some reason or other, the urine of the patient was not kept and so sugar estimation could not be done. However, 20 units of insulin were administered at about 4 p m. At about 8 p.m. I had occasion to see the patient and I was surprised to find him in a semi-comatose condition with shallow respirations and a full bounding

pulse, and veins distended. There was absolutely no smell of acetone in the breath. Luckily however, some urine was obtained by catheterisation and was examined. There was no sugar, no albumen, no acetone bodies. The condition of the patient was evidently one of hypoglycæmia due to the administration of the insulin at 4 p.m. Probably the blood sugar was more or less normal and had now been lowered by the injection. Glucose saline per rectum and an injection of pituitrin and adrenalin were given and in about an hour the patient came round. This case illustrates the importance of urine analysis, but for which, the patient would have probably been given another dose of insulin, (his condition being diagnosed as diabetic coma) with disastrous results

A similar case occurred in a child of about 10 years admitted in a comatose condition There was no history of injury or epilepsy and the temperature was normal. An examination of the urine however showed sugar and acetone bodies The condition was one of diabetic coma Small doses of insulin were administered and the patient improved.

The next case was a patient of about 30 years of age admitted for diarrhœa of 2 days duration The motions did not contain any mucus or blood and there was no history of dysentery. His diet for the last 3 or 4 days had been quite the usual one and there was no suspicion of any gastro-intestinal irritation or poisoning. The cardiac and respiratory systems were normal and the temperature and pulse were normal. A microscopic examination of the stools revealed plenty of ankylostome ova, about a dozen in a field with a ⅙ objective. The patient was treated with Oleum Chenopodium and Carbon tetrachloride and passed numerous hook worms, with the result that in two days, his motions were well

formed and normal. In moffusil hospitals or dispensaries, in some of which microscopes are not provided, the patient would probably have been treated with Bismuth and pulv creta aromaticus "ad lib" without benefit. Practitioners in the tropics beware of the many manifestations of ankylostomiasis.

Another very interesting case was that of an adult male well built and apparently healthy with a few anæsthetic patches on the thigh A hasty diagnosis of anæsthetic leprosy was made and the patient nearly treated for it but an inspiration at the 11th hour resulted in an examination of the urine revealing large quantities of sugar and this change the entire picture. A course of insulin injections was started and there was remarkable improvement The case was one of diabetic neuritis manifesting in an unusual way

The lesson learnt by the above was very helpful in another case that of a lady, who had anæsthetic patches on various parts of the body and which had been diagnosed by a doctor as anæsthetic leprosy. She was advised a course of E.C.C.O. and came to her family doctor with the ampoules for injection. An examination of the urine revealed plenty of sugar. Insulin injections were given and there was remarkable improvement.

The next case I am mentioning in this article is about a middle aged man, with a long standing history of discomfort in the abdomen vomiting and biliousness. At times the vomiting used to relieve the pain He was pale and emaciated. There was no history of fever The patient had gone to different doctors and had been diagnosed differently as tuberculosis, cancer, gastric ulcer, etc.

At the time of examination this patient felt feverish and his temperature was found to be above normal. A

blood smear was taken and revealed numerous malignant tertian crescents. A course of Quinine set the matters right in a few weeks. The patient put on weight and flesh and his tuberculosis, cancer and gastric ulcer were radically cured. It was a case of bilious remittent malaria Practitioners in the tropics beware of the numerous manifestations of malaria.

The last case was that of a young man, of about 25 years of age who was found suffering from convulsions and coma His father and uncle were epileptics and there was a history of epilepsy in some of his other relatives also. The history given by the relatives who brought the case pointed to idiopathic epilepsy There had been no history of injury to the head or of previous attacks of fits Had the urine not been examined the case might have been diagnosed and treated as idiopathic epilepsy. A catheter was passed and about an ounce of urine was drawn It was loaded with albumen and contained a few granular casts. A blood urea estimation was immediately done and it was sound to be about 80 mgms. per 100 c.c. thus settling the diagnosis of uræmia In spite of appropriate treatment the patient succumbed.

The cases cited above show the importance of a systematic examination of the urine, fæces, blood and every available material wherever possible. It not only gives satisfaction to the clinician, but is also gratifying to the patient To my mind there is no excuse for a doctor practising the gentle art of healing without the necessary equipment such as a microscope, sphygmo manometer, urine analysis out-fit, which perhaps is even more important than the venerable stethoscope. It is still more inexcusable, that, having such necessary epuipment a doctor cannot spare a few minutes of his "valuable time" for such examination.

MEMORANDUM.

FROM

M.R.Ry. Rao Bahadur M KESAVA PAI, Avl., M.D.,
President,
Madras Medical Association.

To

The Secretary to Government,
Department of Medicine and Public Health,
Madras,

Through The Surgeon-General with the Government of Madras,

Sir,

I have the honour to submit herewith a memorandum which the Executive Committee of the Association has requested me to forward to you on the subject of the position created by the recent resolution of the General Medical Council of Great Britain.

I request that the Madras Government may be pleased to take the necessary action on the lines which this Association begs to suggest and to kindly favour me with a reply in due course.

I have the honour to be,
Sir,
Your most obedient servant,

M. KESAVA PAI,
President, Madras Medical Association.

MEMORANDUM OF THE MADRAS MEDICAL ASSOCIATION submitted to the Government of Madras through the Surgeon-general, on the General Medical Council refusing further recognition of Indian Medical Degrees in general, and of the Medical Degrees of the Madras University in particular

The Association begs leave to submit the following Memorandum regarding the recent decision of the General Medical Council, and trusts that the Government will be able to take such action as it may deem fit on the points raised herein.

The Association would submit that it is vitally interested in this question inasmuch as it will affect to a large extent the position of the *alumni* of the Indian Universities who form the bulk of its members and will have a vital effect upon the progress of Medical Education in general in this country It would also submit that this is a question which will affect materially its future members, and hence the Association submits that no apology is needed on its part for submitting this Memorandum.

The Association would frankly admit that there are advantages in the General Medical Council recognising the Degrees of Indian Universities in general These advantages are.—

(1) that such degree-holders will be entitled to practise in the different parts of the British Empire subject to any local rules and regulations,

(2) that they will have facilities for acquiring post-graduate qualifications in the United Kingdom,

(3) that it gives them an opportunity under conditions of reciprocity to practise in such countries with which the General Medical Council has at present reciprocity of treatment, and

(4) that certain private organizations and associations both in India and elsewhere have tacitly agreed to appoint only those on the Register of the General Medical Council, or holding such registrable qualifications to any posts within their gift.

It is thus obvious that the Association feels that it is not without seriously considering the question that anyone would try to break the cordial relationship that should exist between a large and influential body like the General Medical Council and Indian Universities in general. At the same time, the position of Indian Universities—some of which have got a long, honourable and historic past—should not be jeopardised and their dignity imperilled by any action calculated to lower them in the estimation of the academic world.

At the recent meeting of the Executive Committee of the General Medical Council held in February 1930, the General Medical Council have resolved not to recognise the Medical qualifications of the Indian Universities on the ground that they will have no authoritative information respecting the Medical qualifications and standards of the Indian Universities and that consequently they are not able to carry out the duties imposed on them under Section 13 of the Medical Act of 1886—which requires that these Universities should "furnish a separate sufficient guarantee of the possession of the requisite knowledge and skill for the efficient practice

of Medicine, Surgery and Midwifery in this country" They have also stated that the proposal of the Government of India to appoint a temporary Board—which proposal emanated from a resolution which was passed unanimously at an Inter-Universities Conference where at all the Universities of India were represented, that this proposal was carefully considered by the Executive Committee, but that it was unable to accept it as furnishing a satisfactory method of supplying the Council with authoritative information on Medical qualifications and standards in India and with the necessary guarantees of sufficiency

The Association submits that the resolution of the General Medical Council has caused a painful surprise and has, in fact, given room for an impression that the Council had taken a view which was not consistent with the requirements even under the provisions of Section 13 of the Act of 1886, and certainly not in consonance with *the practice which prevails in the United Kingdom* under similar circumstances.

The Association would, in this connection, draw the attention of the Government to the fact that it was for the first time in 1922 that the question arose as to whether the Indian Universities satisfied the requirements of the General Medical Council in particular subjects, and a previous reference to this correspondence will show that the chief doubts were with regard to the teaching of Midwifery. It was with a view to look into this question that Sir Norman Walker (then Dr. Norman Walker), Chairman of the Examining Committee of the General Medical Council, was, first deputed to visit the different Universities, and Col Needham was on that occasion to accompany him in his tour, and the entire

responsibility for the report devolved upon Sir Norman Walker. It is also interesting to note that on this occasion, the Government of India desired that when Sir Norman Walker visited the Madras University, he should be accompanied and assisted by three medical men—one of whom might suitably be an official and the other two non-officials, and these persons should preferably be experienced Gynæcologists, able to explain the conditions in respect of Midwifery training. It may also be pointed out that on that occasion the persons selected by the Local Government were .

Major (now Lt-Col) C A. F. Hingston, I.M S.,
Dr. (Miss) McNeill. and
Mr. N. D Damry.

The Association would like to emphasise on this aspect of the case, because it shows that at that early stage, both the General Medical Council and the Government were quite aware that inspection of the Medical Colleges could only be done by specialists and that for each particular subject the specialists in that particular subject should have the predominant voice The Association would like to refer to the terms under which these three persons were asked to assist—that their main object was "to explain the conditions in respect of Midwifery Training" to the official visitor.

It would be relevant in this connection to state what the position is in regard to inspections carried on by the General Medical Council about the training and the examinations of the different British Universities The General Medical Council has to appoint *an Inspector for each one of the subjects, who shall be an able, experienced Professor* of long standing, and in virtue of

this rule, it has always been the policy of the General Medical Council in constituting Inspection Commissions for the different British Universities, to have a representative each for the subjects of Medicine, Surgery and Midwifery. That it is a salutary principle and that any violation of this principle would not in the least bit be countenanced by the British Universities, is obvious. Sir Norman Walker himself, the Chairman of the Commission, could only proceed on the reports submitted by these experts The very value of the inspection would be lost if instead of experts visiting and directing and guiding the different Universities, it were possible for any person, who has no direct teaching experience and who cannot by any stretch of imagination be considered an expert in the particular subject, to inspect and to judge the work of the experts in their own fields. The demand of the General Medical Council for a single Commissioner to inspect the Medical qualifications and standards is hardly tenable, both on grounds of efficiency and on the ground of the procedure adopted by this Council with reference to the British Universities

The Association desires to state that the Inter-Universities Conference definitely considered this question and resolved that it could not possibly deem it expedient or useful in the interests of Medical Education to assent to the appointment of a single Inspector The Association is surprised that the General Medical Council should insist on such a condition. The onus rests upon the General Medical Council to prove to the medical world of this country and of any other country, that the procedure they insist upon with reference to the Indian Universities is a procedure which will commend itself to the thinking public. The Association has no desire to

enter into personalities, but would at the same time respectfully submit that it cannot but state that the insistence of the General Medical Council on the appointment of a single Medical Inspector and the fact that the General Medical Council will be quite satisfied if Col. Needham were appointed for this particular purpose, would make the Association respectfully question the position of the General Medical Council. Col Needham has, no doubt, been inspecting some of the Universities for some time past; but the Association would like to draw the attention of the Government to the fact that Col. Needham has never been a Professor in any of the Medical Colleges, has had no direct experience of teaching and cannot certainly be expected to be an authority to pronounce upon the work and methods adopted, the standards and the examinations as conducted by experts in their own fields in Medicine, Surgery and Midwifery and other subjects. The Association does feel that it cannot accept the position that Col. Needham can sit in judgment over the work of, for instance, Col. Green-Armitage and Col Hingston in Midwifery, Col. Sprawson and Col Malcomson in Medicine, Col. Broome and Col. Bradfield in Surgery. It is for the General Medical Council to explain why it insists upon a single Medical Inspector and why it is easily satisfied with the appointment of Col Needham for this particular purpose.

The Association would, in this connection, invite the attention of the Government to the very important letter despatched from the India Office on the 11th January 1930 communicating the views of the Government of India In the course of the letter, Mr. Turner states

"It will be seen that the Government of India are of opinion that it is not possible to reopen the question

of the appointment of a Commissioner of Medical Qualifications and Standards in view of the strong opposition to the proposal in the Indian Legislative Assembly and the opinion recorded by the Indian Universities Conference which met at Delhi in October last. Mr. Benn trusts that in the circumstances, the General Medical Council will not insist on such an appointment pending the creation of an All-India Medical Council by a Statute

" The Council will also observe that the Government of India propose as a temporary measure pending the setting up of an Indian Medical Council, to proceed at once with the appointment of a Board consisting of the Director-General, Indian Medical Service, as President, and of representatives from each Medical Faculty of the Indian Universities as members, for the purpose of determining and supervising Medical qualifications and standards The functions of the proposed temporary Board which will be of the same nature as those which it is anticipated will ultimately devolve on the All-India Medical Council are fully explained in the Government of India's telegram. The three Inspectors proposed to be appointed by the Board will, it is expected, possess British qualifications and will be specialists in Medicine, Surgery and Midwifery respectively—the three main subjects of the Final Examination and for that reason it is urged that their reports are likely to be of a more authoritative character than those of the single Commissioner".

" The Secretary of State is informed that the Government of India desire that they should inspect the examinations to be held in March next Mr. Benn has no doubt that the proposal of the Government of India will receive the very careful consideration of the General

Medical Council at an early date. He hopes *that the measures now proposed, if adoped, will furnish the necessary guarantee*, and will be acceptable to the Council and that they will be able to continue temporarily the recognition accorded to the Indian Medical Degrees".

At the same time, the Vice-Chancellor of the University of Lucknow, Dr. M B Cameron, in his capacity as Vice-Chancellor, addressed the President of the General Council of Medical Education and Registration of the United Kingdom, and in the course of the letter, dated November 14th, 1929, stated —

"It seems to me that it is very possible that the situation in India with reference to the alternative conditions for Registration is not fully understood in England. The proposal of a permanent Inspector was definitely turned down by the Standing Finance Committee of the Legislative Assembly, and will, in my opinion, always be turned down being wholly opposed not only to practise elsewhere but also to the whole trend of Indian public opinion. The Medical profession are here entirely at one with the Legislators. There seems nothing, however, to hinder the Government now bringing forward the bill for the constitution of the Indian Medical Council in the Legislative Assembly and as far as I could gather in influential quarters both here and in Delhi, the chances of success are all the stronger because of the recent rejection of what seemed to the Legislative Assembly—or possibly may have seemed to you also the worse alternative of the permanent Inspector. My only excuse for troubling you with this my private and unofficial view of the situation is that not only as Vice-Chancellor of the University but

also as one who has spent a life-time for higher education in India, I share in the full the great concern with which our Medical Faculty regard the prospects of our students losing registrable qualification."

It need hardly be said that for all these representations, the only reply vouchsafed by the General Medical Council was its resolution—that 'in the absence of authoritative information respecting the Medical qualifications and standards of the Indian Universities of Bombay, Calcutta, Lucknow, Madras and Punjab, the Executive Committee of the Council, in fulfilment of its duty under the Medical Act of 1886, Section 13, is unable, for the time being, to recognise the Medical degrees of these Universities as furnishing a sufficient guarantee of the possession of the requisite knowledge and skill for the efficient practice of Medicine, Surgery and Midwifery in this country, and that accordingly the conditional recognition hitherto granted to these degrees has now lapsed.'

2. 'That the proposal of the Government of India to appoint a temporary Board contained in the letter from the India Office of January 11th, 1930, has been carefully considered by the Executive Committee, but it is unable to accept the proposal as furnishing the satisfactory method of supplying the Council with authoritative information on Medical Qualifications and Standards in India and with the necessary guarantees of sufficiency.'

The Association, would, in this connection, refer to an aspect of the question that has unfortunately crept in. It seems to be understood in some quarters and we note that the British Medical Journal, in its issue ,of March 15th, 1930, has made the suggestion more openly—that

the decision of the Government of India was forced by other considerations not relevant to a dispassionate consideration of the question. It has been suggested that political considerations dominated the situation and to this extent therefore, the decision has been vitiated and therefore need not be taken seriously The Association admits that the unfortunate necessity for discussion of such a question in a political Legislature might, in the first instance, suggest that the question was considered on different lines , but a closer examination of the situation would at once reveal the fact that in discussing this question, the General Medical Council, or any other body, should really take not exclusively the debate in the Legislative Assembly into consideration, but the more important debate at the Inter-Universities Conference where in the presence of distinguished representatives of the 17 different Universities in India, the resolution was unanimously adopted

> "That this Conference is of opinion that the appointment of a Commissioner of Medical Qualifications and Standards contemplated by the Government of India is not in accordance with the best interests of Medical Education in India".

It seems to us that whatever may be said of the discussion of the question in a political legislature, it would be unfair that any Educational Conference so representative in its constitution and so distinguished in its personnel as the one that met at Delhi—could even be thought to be swayed by any other considerations except those purely academic and relevant to the main decision arrived at on such an important matter.

The Association would beg leave to state that these Universities—particularly the Universities of Calcutta, Bombay and Madras,—are as old as—or even older than—the General Medical Council, that, in fact, they were constituted in 1857, while the General Medical Council took its birth in 1858—and that their traditions, their long historic past, and the ideals for which they stand, should at least have merited a more serious consideration than the one that seems to have been bestowed by the General Medical Council.

Considerable emphasis has been laid upon the fact that the General Medical Council had to fulfil its duty under the Medical Act of 1886, Section 13, and for this purpose, it had no option in the matter but to insist upon such conditions as it deemed fit The Association is fully aware of the rights of the General Medical Council in this respect, and it has no doubt whatever, that in the recent decision, the General Medical Council was actuated by no other considerations than those that seem to have weighed upon it so heavily under the particular section quoted above. At the same time, the Association does feel that this particular duty is a duty not of recent growth, and as the Act itself states, it is a duty which devolved upon the General Medical Council even from 1886 It is, however, a fact that till the year 1922, *no doubt* seems to have arisen in the mind of the General Medical Council with regard to the possibility of its not fulfilling the duties required under Section 13 of the Act of 1886. Since then the General Medical Council has practically insisted upon an annual inspection report on the Indian Universities and has accorded conditional recognition from year to year and in some instances even for a shorter period than a year, a recognition absolutely unparalleled in the history of the General Medical Council.

The Association would also beg leave to state that there are qualifications on the Colonial List about which there seems to have arisen *no doubt* whatsoever about the fulfilment of Section 13 by the General Medical Council. The Association is not aware of any similar treatment accorded, for instance, to the University of Malta or the Newfoundland Medical Board, or the the University of New Zealand, while in the case of Canada, South Africa and Australia, to a cable from the Government of India to the Council, it is stated that since there were statutory medical councils responsible for standards established in Australia, Canada and South Africa, no commissioners are necessary for recognition.

The Association wishes to state that in 1922 the question that was dominant was the training in Midwifery—specially on the practical side of it—and this question was as important in the British Universities as it was in some of the Universities elsewhere That the training in British Universities was lacking in several material respects and fell far short of the requirements of the General Medical Council, will be obvious from a perusal of the Report on the training in Midwifery submitted by Dr Jane-Campbell to the Ministry of Health, in 1924 In spite of these serious defects —defects which were not rectified despite frequent remonstrances from the General Medical Council—no disciplinary steps were ever taken against any of the Universities thus affected

In a recent article Dr. Comyns Berkely, the Senior Obstetric Surgeon to the Middlesex Hospital, reviewing the whole question states

" Again it may be said 'why has the General Medical Council not done more for insisting that the various

regulations they have made since 1859 should be carried out? This Council has the power to insist upon the compliance of the various teaching institutions and licensing bodies with its regulations, and if such are ignored, as they have been year after year, it can report the matter to the Privy Council and have the qualifying body deprived of its powers in this respect In one sense, there is no answer to this question but in another sense, the answer is quite complete. The General Medical Council has realised from the first that to strike a licensing body off the list is almost comparable to persuading the camel to walk through the eye of a needle It did try on one celebrated occasion, but the unsatisfactory result of its endeavours and the worry and disturbance resulting from its well-meant efforts, further confirmed the impression it had formed from the first, that the best and easiest way to obtain compliance with its Regulations was one by peaceful persuation, as can well be imagined, from the one I have presented of its meeting, with respect to the teaching of Midwifery, the qualifying examinations thereon."

The Association is grateful to Dr. Comyns Berkely for so clearly elucidating the position of the General Medical Council and the extent to which it is able to satisfactorily perform those very duties imposed upon it by statutory obligations It is remarkable that while the General Medical Council is not able to remove one single qualification from the list of qualifications registrable in the United Kingdom, whatever may be the provocation, by a single act or rather by a single resolution of the Executive Committee the Council has been able most effectively to erase from its Register all the qualifications of the Indian Universities which had been registrable

for nearly half a century The Association has no intention of making any further comment on this picture.

The association further submits that so far as Madras in concerned, the recommendation of Sir Norman Walker have been faithfully carried out and both the Government and the University have accepted these recommendations in their entirety and given effect to them. The Madras Medical College is, as authoritatively stated by its Principal far better equipped than it ever was before and has in fact successfully inaugurated all the reforms suggested in the report of 1926 Inspite of this fact the General Medical Council has summarily declined to consider the case even on its merits

There is one aspect of the question which the Association is anxious to invite the attention of Government Ever since 1922, the Medical qualifications of Indian Universities have been under a cloud of distrust and suspicion, thanks to the General Medical Council and this has had a very deleterious influence not only on the Medical degrees, but also on other degrees of the Indian Universities so far as foreign Universities were concerned The Association understands that consequent upon the attitude of the General Medical Council, in foreign countries and especially on the continent, there has of late been an attitude which cannot but be said to be not entirely favourable to a sympathetic reception of the Indian degree-holders in the continental medical clinics. It has not, of course, led to any serious difficulties, but it seems to be inevitable that with the frequent undermining of the prestige of Indian Universities, the time will soon come when it will be taken for granted that these Indian Medical degrees are so valueless that they deserve no consideration at the hands of the 'continental

authorities The General Medical Council has, in effect, therefore, not only effectively damned this qualification from their own point of view, but helped to their effective effacement in the eyes of the Medical world in other countries. The Association cannot contemplate with equanimity the position that will thus result

The Association trusts that it has not taken a too pessimistic attitude when it feels great doubts whether, even when an All-India Medical Council is legally constituted, the General Medical Council may not prefer the raising of doubts, from one point of view or another, about the standards and qualifications here and claim under Section 13 the same right it has exercised now of turning down these qualifications once again The utmost that the General Medical Council has been graciously pleased to vouchsafe at present is a sympathetic consideration when such an All-India Medical Council has been formed. In fact, the letter of the President, dated 6th December 1929, wherein he says —"Our present information is that many succeed in obtaining Indian medical degrees who cannot be accepted for a minimum qualification in this country and therefore we can do no other than discontinue our recognition"— seems to be an ominous pronouncement—and one for which the Indian Universities will be entitled to ask for *substantial proof*

The Association therefore begs to submit, in conclusion, for the favourable consideration of the Government, the urgency of setting up an All-India Medical Council who will lay down the standards and qualifications necessary for this country and would also be in a position, as other Councils set up in the different parts of the British Empire, to proceed on the strict

basis of reciprocity of treatment—whether it be the Generat Medical Council or any other foreign Council.

The Association would also beg to submit that it is very desirable in view of the developments, that every encouragement should be given to its members and alumni of the Indian Univesities to proceed to foreign countries either on the continent or elsewhere for post-graduate study and training that may be necessary, and for this purpose the Association submits that it is desirable that the Government should encourage the study of some of the European languages, like French or German, and should, if possible, give the same encouragement by way of conditions of service or financial bounty as they now give, to those who qualify in one or other of the Indian Vernacular languages.

The Association finally begs leave to submit that it has approached the question only from the point of view of Medical Education and the interests of the alumni of the Indian Universities and has not been swayed by any other consideration The General Medical Council may be well within their rights the Association submits that as the question is one dominantly connected with the future of Allopathic Medicine in this country, it is incumbent on the Government to take the necessary action and safeguard, promote, and foster despite the severe handicaps imposed upon them by the General Medical Council's attitude ever since the year 1922, the institutions which at present are so conscientiously and so seriously trying to do their best for the promotion of Western Medical Science.

CASE REPORTS.

A Case of Diffuse Endothelioma of Bone.

(*Department of Pathology, Medical College, Madras*)

Name and age R—45 years. Hindu, male, Admitted into the General Hospital on 21st December 1929 for a swelling of the lower end of the right forearm and wrist—2 years' duration

History of the case.—The swelling started 2 years back when it was small and painless Since the last 4 or 5 months it has been increasing in size and is painful There is inability to move the wrist General condition of the patient on admission into hospital is good

Local condition—There is a somewhat rounded swelling of the size of a large orange at the lower end of the right forearm, around the wrist, slightly warm to the touch Veins are prominent over the swelling and there is fluctuation in some areas. There are a few nodules, over the swelling, some of which are hard , there is tenderness The ulna can be palpated distinctly, but not the radius The movements of the wrist joint are markedly limited

Investigations done —

Wassermann reaction—negative

X-Ray report Regular expansion of the lower end of the radius The wrist joint is not involved

Ulna is free Suggestive of myeloma.

PATHOLOGICAL REPORT

Naked eye appearances of the specimen —The lower end of the radius is enlarged and expanded and shows an ulcerated mass of the size of an areca nut On section, the expansion of the radial end is well seen which is filled with a pink brown mass in which are areas of hæmorrhage A well marked capsule, partly bony and partly fibrous, is seen all round The radio ulnar and the radio-metacarpal joints are not involved

Microscopically —Under low power the section shows a well marked fibrous capsule Groups of cells are arranged in whorls around clear spaces Numerous multinucleated giant cells are distributed throughout the section The section is very vascular, large areas of hæmorrhage being seen here and there. Under high power the cells are some flat and others

cuboidal with large vacuolated nuclei and scanty protoplasm In between the cells are spaces lined with definite endothelium, most of them being empty and a few containing coagulated eosin staining material These cells appear to be proliferating endothelial cells Scattered in between, are seen large multinucleated giant cells

The chief points of interest in this case are,

(1) The comparative rarity of endothelioma of bone especially at the age of 45. This tumour according to Ewing usually occurs in young adults below 20 years of age

(2) The long duration of 2 years.

Our thanks are due to the First Surgeon, General Hospital, Madras, for permission to report this case

A Case of Leiomyoma of the Kidney

(*Department of Pathology, Medical College, Madras*)

Name and age —Vasudevan. 22 male, Hindu Admitted into the General Hospital, Madras, for a tumour of the abdomen situated in the right hypochondriac region of 3 years duration On Laparotomy the tumour was found adherent to the right kidney.

Naked eye appearance of the tumour —The tumour was of the size of a cocoanut and has a definite fibrous capsule On section it is of a pale brown colour with irregular areas of a pale bluish colour giving it a typical 'watered silk' appearance There are also a few opaque yellowish brown areas.

Microscopically the section shows bundles of plain muscle fibres—separated by fibrous tissue—a-Leiomyoma

The special feature of this case is the unusual occurrence of such a tumour in the kidney.

Another case of interest is Rhinosporidium on the inside of the upper eyelid The patient is an old man of 50 years, belonging to Palghat The tumour was a granular growth, of the size of a bean, hanging from the inside of the upper eyelid. It was 2 months' duration The situation of this tumour is peculiar in this case.

ASSOCIATION NOTES.

A meeting of the Executive Committee of the Association was held on Tuesday the 21st January 1930 at 5-30 p m, at Srinivas, Harris Road, Madras

PRESENT —Rao Bahadur Dr M Kesava Pai, Drs G. Srinivasamurthi, P Venkatagiri; A S Mannadi Nayar, and K. Koman Nayar

The Annual Report for 1928-29 and the Auditor's report for the same period were considered and adopted

The date of the next Annual General Meeting was fixed for 15th February 1930

Minutes of the Annual General Meeting, held on the 15th February 1930 at the Medical College, Madras, at 5-30 p m

The Annual Report, copies of which had perviously been circulated was taken as read and passed

60 Voting Papers were received and as a result of scrutiny of these, the following were declared elected as office-bearers.

President —Dr M Kesava Pai *Vice-Presidents* —Drs A Lakshmanasami Mudaliar and T. S Tirumurthy *Members of the Executive Committee* —Drs S Ramakrishnan, A Srinivasulu Naidu, P V Cherian, P Venkatagiri, G R. Dinker Rao, C Abbu, A K Murthy, N Alahasingam and M J Santhanakrishna Pillai

Letter from the Malaya States about the British Medical Association not treating Madras L M S. properly was read.

A meeting of the Executive Committee of the Association was held on Friday the 21st February 1930 at 7 p m at Srinivas, Harris Road

PRESENT —Rao Bahadur Dr M. Kesava Pai, Rao Bahadur Dr. A Lakshmanasami Mudaliar; Drs A Srinivasulu Naidu; M J Santhanakrishna Pillai, P V Cherian and S Ramakrishnan

The following were elected as office-bearers for the current year —

Drs S Ramakrishnan and A Srinivasalu Naidu as Joint Secretaries Dr. A Srinivasalu Naidu as the President, with the following 14 members to constitute the Magazine Committee.

Names —

1 Dr B V Varadachar, M.B C M
2 Assistant Superintendent, Head Quarters Hospital, Madura.
3 Assistant Superintendent, Medical School, Coimbatore
4. Dr. G Dinker Rao, M D.
5 ,, K. P Menon, M.B B.S
6 ,, P Venkatagiri, M D
7 ,, G. R Parasuram, M.R.C P
8. ,, K. Venkatachalam, L M S
9 ,, G Srinivasamurthi, M B.C.M
10. ,, K. Koman Nair, L M S
11. ,, R. Narasimham, F R C S.
12 ,, Mangesh Rao, F.R C S
13 ,, K. Vasudeva Rao, M D.
14. ,, L. Ananthanarayana Iyer, M B B.S.

Dr. P V Cherian to continue as Treasurer.

The Secretaries were requested to draft an appeal to all members of the Madras Medical Association to co-operate in the working of the Association.

A letter from the L M S graduates of Malaya regarding the recognition of their degrees by the British Medical Association of Malaya was considered and a draft reply was approved Read letter from Government regarding pension and a letter

from Dr Subramaniam regarding increments during temporary service The Secretaries were requested to draft a reply and place the same before the next Executive Committee meeting.

A meeting of the Executive Committee of the Association was held on Wednesday the 12th March at 6 p m. at 48, Harris Road

PRESENT —Rao Bahadur Dr M Kesava Pai, Drs A Lakshmanasami Mudaliar, P Venkatagiri; P. V. Cherian, A. S Naidu and S Ramakrishnan.

The replies drafted by the Secretary regarding pensions and the letter of Dr D. Subramaniam were approved

The Magazine Editorial Secretary was requested to send the next issue of the journal as a combined January and April issue The distribution of the journal was restricted to members only for the present

An ordinary meeting of the Association was fixed for the 22nd March, when the President generously promised to entertain the members with tea

The President was requested to address the Government to inform the Association as to what further action has been taken by Government in the matter of the representations made by the Association which waited in deputation last May, and also to furnish a copy of the report of the Medical Education Committee.

An ordinary meeting of the Association was held at the Medical College at 5-30 p m on the 22nd March 1930

Twenty-four members were present

After tea the President exhorted the members to hold more frequent meetings and take an active interest in the Association first by inducing all service men to become members and secondly by contributing articles to the journal Dr. C Ramakamath speaking next said that the Association might send a protest against the action of the General Medical Council He suggested that in addition to original contributions, members might send extracts from different medical journals for publication in the journal Dr. R Viswanathan suggested that the members should meet at an Annual Conference in Madras Dr P K Warrier presided

EDITORIAL.

The G. M. C. and Indian Medical Degrees.

Elsewhere we print the Memorandum submitted by the Madras Medical Association to the Government of Madras through the Surgeon-General, regarding the recent decision of the General Medical Council not to recognise the medical degrees of Indian Universities. The Memorandum is a weighty document and presents the case of those who feel that in their recent decision, the General Medical Council has not taken into consideration all the facts relevant for a just and equitable solution of this outstanding problem.

The Memorandum recognises the value of recognition of Indian degrees by the General Medical Council and advantages that accrue to the medical graduates At the same time, the Association, while anxious to continue the cordial relations that should exist between a powerful body like the General Medical Council and Indian Universities in general, places before the Government an aspect of the case which it is worth while closely examining.

We hope that the Memorandum will receive due attention and that efforts will be made to see that ere long a solution satisfactory alike to all parties concerned is reached.

CORRESPONDENCE.

MADRAS MEDICAL COLLEGE,
Dated 12th February 1930.

To

THE PRESIDENT,
MADRAS MEDICAL ASSOCIATION.

SIR,

I have the honour to request you to place the following matter before the members and the Committee for consideration and then submission to the Surgeon-General and the Government

In view of the fact that the Gazetted Officers in other departments as Judicial, Revenue, etc , are given the privilege to draw their increments in pay and are allowed to contribute towards provident funds from the date of entering service and irrespective of the date of confirmation in the Department. We request the Government that the existing ban of allowing us to draw our increments in salaries only from the date of confirmation, be removed and the same privilege as exists in other departments be granted to us also

I have the honour to be,
Sir,
Your most obedient servant,
(Sd) D SUBRAMANIAN, M B , B.S ,
Assistant to the Professor of Pathology

THE MADRAS MEDICAL ASSOCIATION,
Dated 13th March 1930

To

DR. D. SUBRAMANIAM,
ASSISTANT TO THE PROFESSOR OF PATHOLOGY,
Medical College, Madras

SIR,

With reference to your letter, dated 12th February 1930, to the President, Madras Medical Association, I am directed by the Executive Committee to reply to you as follows —

According to clause (*c*) of Rule 6 of Madras Medical Service General Branch Rules in G. O. No. 1027, dated 9th October

1929, a probationer will get pay calculated at the rate admissible to a member of the service and would get the usual increment in the time scale and all periods of probation after 9th October 1929 counts for increment

The question of increment as regards those whose probationary period began before that date is under correspondence and there is every likelihood of this being settled favourably

S. RAMAKRISHNAN,
Honorary Secretary

MADRAS,
13th March 1930

FROM

RAO BAHADUR DR M KESAVA PAI, M D,
PRESIDENT,
Madras Medical Association.

To

THE PERSONAL ASSISTANT TO THE SURGEON-GENERAL WITH THE GOVERNMENT OF MADRAS.

SIR,

With reference to your R 55-A, dated 20th January 1930, forwarding No 40693 G. & P-3 of the Finance Department of Madras, dated 6th January 1930 The Madras Medical Association expresses its views as follows —

The Association would agree to surrender one-third of the prospective pension in exchange for the guarantee of a lump sum payment.

The Association considers that the substitution of a contributory provident fund is not desirable as it may involve the risk of the officer being left destitute along with his family in the event of an improvident or unfortunate investment of the provident fund amount

The Association would welcome compulsory life Insurance and would suggest in the case of uninsurable lives, they may be required to contribute to the General Provident under the

existing terms Of course it will be open to a Government servant to have both insurance and provident fund if he can afford it, instead of being made an alternative

The Association would suggest that this procedure be combined with the surrendering of one-third of the prospective pension in order to ensure adequate provision for the family in the event of the officer's death or sufficient means of a decent living in the contingency of the officer living to enjoy his pension.

The Association considers that full surrendering of pension for a lump payment at death is open to the same risk as that pointed out in the case of substitution of a contributory provident fund

The Association considers it desirable to have compulsory life Insurance for future entrants into service and to those who have put in less than five years of service

I have the honour to be,

Sir,

Your most obedient servant,

M KESAVA PAI,

President, Madras Medical Association.

REVIEWS.

The Indian Medical World, a copy of which was received for exchange, is a journal which has appeared in right time, emanating as it does from such Editors as Sir Nilratan Sircar, Kt, M.A., M D., D C L, etc. Being the organ of the Indian Medical Association, whose avowed object is "to look after the interests of the medical profession, public health and medical education in India," it will have a healthy unifying influence on the profession in India, will annihilate the present caste system prevalent in the medical profession, and dispel the pessimism wrought on the profession by the decisions of the General Medical Council by strengthening the profession in all possible ways and helping the Governments, provincial and central, in the enunciation of a far-reaching policy of medical education, registration, recruitment, research and appointment, with one standard for all provinces. The Editorial, pregnant with facts and reasons, is very educative The subject-matter of the first issue of the Journal is equally interesting, as it deals on the various aspects of the healing art and is an object lesson to be emulated A striking feature is the inclusion of opinions expressed by the lay public on the efficiency or otherwise of the Indian Medical world, which are now brought before the entire fraternity for serious and sobre thought and unvincing criticism, which otherwise would die unhonoured and unsung It is good that every one high or low in the profession knows how he is talked about In that way the Journal has done a pioneer and yeoman service, a method which may profitably be copied by other Journals.

Medical Men in all provinces may strengthen the hands of the Journal which may ultimately become the 'one voice' for India, by merging other mushroom efforts in a common endeavour.

NEWS.

We are glad to announce that Dr A Lakshmanaswami Mudaliar, B.A , M D., has had the honour conferred on him of being elected a Foundation-Fellow of the British College of Obstetricians and Gynæcologists. The Foundation-Fellowship has been conferred upon prominent Obstetricians and Gynæcologists of long standing who are deemed worthy of that high honour by the College We offer our hearty congratulations to Dr. Mudaliar on this unique honour. We feel sure that the medical profession of this Presidency will congratulate itself on having one amongst them on whom such a well-merited distinction has been conferred. It is an honour alike to the University that one of its alumni has been the recipient of this high honour, and lastly we feel sure that the honour is a tribute to the great institution with which Dr. Mudaliar has been so long associated the Government Hospital for Women and Children, Madras.

The *Indian Medical Gazette* of March 1930 writes as follows :

" Liuet -Col. V B Green-Armitage, M R.C S , L R C P , M D., F.R.C P , I M S , Professor of Obstetrics and Gynæcology and Surgeon of the Eden Hospital, Calcutta Medical College, has been elected a Foundation-Fellow of the British College of Obstetricians and Gynæcologists. Our

readers will join us in our congratulations to him on so well deserved an honour which is not only a personal one, but also a tribute to the Indian Medical Service and to the work done at the Eden Hospital, Calcutta."

We cordially associate ourselves with the sentiments expressed by our contemporary. Col. Green-Armitage has been one of the Chief Obstetricians and Gynæcologists in Bengal who has done a great deal to popularise modern methods of Midwifery and Gynæcology in the Tropics and we extend to the Colonel our heartiest felicitations.

We offer our hearty congratulations to Dr. T. S. Tirumurti, B.A., M B., C. M, D. T M & H, on his recent appointment as the Principal of the Medical College at Vizagapatam He is the first Indian and the first in the Provincial Medical Service, to hold this responsible office even for a short period. We have no doubt that Dr. Tirumurti will amply justify the choise, for in him the Provincial Medical Service has got an officer of great administrative and professional ability

We extend a cordial welcome to the new Surgeon-General, Lt.-Col. Sprawson, M.D., F.R.C.P., I. M S., who recently took over charge of his exalted office. Col. Sprawson has had a distinguished career in the Indian Medical Service, as Professor of Medicine and as Principal of the Lucknow Medical College, and more recently as Inspector-General of Civil Hospitals, United Provinces We feel sure that his large and varied experience both on the educational and on the administrative side, will be utilised for the advance of the medical profession in this Presidency There are many problems that still await solution and from the sentiments given expression

to by General Megaw on the eve of his departure, we are confident that the interests of the Medical profession and of the services will be safe in the hands of our new Surgeon-General

It is a matter of sincere gratification to us that several members of our service have been the recipients of high academic honours both here and abroad We offer our hearty congratulations to Dr. P. Kutumbiah, M B., B.S, on his obtaining the M.R.C.P (London) and to Dr. M. G. Kini, M.B., F.R C.S (Ed.) on his passing the M Ch. (orthopedics) Liverpool. We congratulate Dr Rajam who has passed the recent M. S. examination of the Madras University and Drs P Ratnaswami, Padmanabha Pai, Venkataraman, Sundaresh and Sundaram who got through the M. D These successes augur well for the future of our service.

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(ESTABLISHED 1903.)

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